

**HEALTH AND SAFETY PLAN
INTERIM MEASURES PROGRAM**

**OCCIDENTAL CHEMICAL CORPORATION
DELAWARE CITY FACILITY, DELAWARE**

**SEPTEMBER 2001
REF. NO. 7462 (12)**

TABLE OF CONTENTS

	<u>Page</u>
1.0 INTRODUCTION.....	1
1.1 PROJECT ORGANIZATION.....	3
2.0 SITE CHARACTERIZATION AND POTENTIALLY HAZARDOUS COMPOUNDS.....	4
2.1 HAZARD ASSESSMENT.....	4
2.1.1 WASTE LAKE NO. 1	5
2.1.2 WASTE LAKE NO. 3	6
2.1.3 SAND BLAST GRIT AREA	6
2.1.4 STORMWATER DRAINAGE CHANNELS AND OUTFALLS	7
2.1.5 GROUNDWATER DOWNGRADE OF THE PLANT PROCESS AREA.....	7
2.1.6 SOIL BENEATH THE PLANT PROCESS AREA	8
2.1.7 OXYCHEM TRIBUTARY AND SD-6.....	9
2.1.8 OLD BRINE SLUDGE LANDFILL	9
2.1.9 NEW BRINE SLUDGE LANDFILL	10
2.1.10 CHEMFIX TEST UNIT	11
2.1.11 STANDARD CHLORINE PIPELINE.....	11
3.0 BASIS FOR DESIGN.....	13
4.0 RESPONSIBILITIES AND ADMINISTRATION.....	14
5.0 WORKER TRAINING AND EDUCATION	16
6.0 PERSONAL PROTECTIVE EQUIPMENT (PPE)	17
6.1 PROTECTION LEVELS.....	17
6.2 REASSESSMENT OF PROTECTION LEVELS	19
6.3 DURATION OF WORK TASKS.....	20
6.4 LIMITATIONS OF PROTECTIVE CLOTHING	20
6.5 RESPIRATORY PROTECTION PROGRAM.....	23
6.6 SITE CONTROL	24
7.0 ACTIVITY HAZARD/RISK ANALYSIS	26
7.1 CHEMICAL EXPOSURE	26
8.0 AIR MONITORING	29
8.1 INITIAL EXPOSURE ASSESSMENT – MONITORING PROGRAM	29
9.0 DECONTAMINATION PROCEDURES – CONTAMINATION MIGRATION CONTROL	30
9.1 EQUIPMENT DECONTAMINATION PROCEDURES	30
9.2 PERSONNEL DECONTAMINATION PROCEDURES	31

TABLE OF CONTENTS

	<u>Page</u>
10.0 GENERAL SAFETY AND PERSONAL HYGIENE.....	32
10.1 HEALTH AND SAFETY VIOLATION POLICY	32
11.0 MEDICAL SURVEILLANCE.....	34
12.0 ENVIRONMENTAL CONTROL PROGRAM.....	35
12.1 WEATHER MONITORING	35
12.2 RAIN AND SNOW.....	35
12.3 TEMPERATURE	35
12.4 WIND.....	36
13.0 CONFINED SPACE ENTRY PROCEDURE	37
14.0 EMERGENCY RESPONSE.....	38
14.1 EMERGENCY CONTACTS.....	38
14.2 ADDITIONAL EMERGENCY NUMBERS.....	39
14.2.1 SITE COMMUNICATION.....	39
14.3 EMERGENCY EQUIPMENT AVAILABLE ON SITE	40
14.4 PROJECT PERSONNEL RESPONSIBILITIES DURING EMERGENCIES	40
14.5 MEDICAL EMERGENCIES.....	41
14.6 FIRE OR EXPLOSION	42
15.0 RECORDKEEPING	43

LIST OF FIGURES
(Following Report)

FIGURE 2.1	SITE LOCATION
FIGURE 2.2	SITE PLAN

LIST OF TABLES
(Following Report)

TABLE 2.1	EXPOSURE ROUTES AND EXPOSURE LIMITS FOR THE CHEMICAL COMPOUNDS PRESENT AT THE SITE
TABLE 2.2	MAXIMUM DETECTED CONCENTRATIONS FOR THE CHEMICAL COMPOUNDS PRESENT AT THE SITE
TABLE 6.1	SPECIFIC PERSONAL PROTECTION LEVELS
TABLE 7.1	ANTICIPATED HAZARDS/RISKS AND APPROPRIATE PRECAUTIONS

LIST OF APPENDICES

APPENDIX A	TRAINING ACKNOWLEDGEMENT FORM
APPENDIX B	DAILY SAFETY MEETING LOG
APPENDIX C	EMERGENCY HOSPITAL ROUTE

1.0 INTRODUCTION

The Health and Safety Plan (HASP) presented herein has been developed for the RCRA Interim Measures (IM) Program at the Occidental Chemical Corporation, Delaware City facility (Site) and is intended to provide the recommended Health and Safety procedures and emergency response guidelines to be implemented during the IM program. A scope of work has been prepared to encompass the potential activities that may occur during the IM Program and should be followed in conjunction with this HASP.

This HASP has been developed to include the following potential IM activities:

- i) mobilization and demobilization of labor, materials, and equipment to and from the Site;
- ii) isolation of all utilities;
- iii) drilling;
- iv) construction;
- v) excavation;
- vi) groundwater sampling activities;
- vii) soil sampling activities;
- viii) sediment sampling activities;
- ix) phytoremediation;
- x) personnel and equipment decontamination.

Actual IM activities may include additional tasks or alterations to some of the above tasks. As appropriate, an addendum will be submitted for the IM at each solid waste management unit (SWMU) or area of concern.

During a portion of these IM activities, personnel may come in contact with air, soils, groundwater, sediments, waste materials and debris that potentially contain hazardous substances. Direct contact with potentially contaminated material by Site personnel will be minimized through the implementation of the procedures outlined in this Site-specific HASP. This HASP has been developed to ensure the following:

- i) that Site personnel are not adversely exposed to the compounds of concern;
- ii) that public health and the environment are not adversely impacted by materials with elevated concentrations of chemicals that could potentially migrate outside of the work zone during project activities at the Site;

- iii) that all Site personnel comply with applicable governmental and non-governmental (American Conference of Governmental Industrial Hygienists [ACGIH]) regulations and guidelines. In particular, the rules of the Occupational Safety and Health Administration (OSHA) for Parts 1926 and 1910 (Title 29 Code of Federal Regulations [CFR] Part 1926.65 and Part 1910.120 - Hazardous Waste Operations and Emergency Response) will be implemented for all Site work; and
- iv) that proper emergency response procedures are established to minimize the potential for any adverse impact to Site workers, the general public, or the environment.

For the purpose of this HASP, activities performed at the Site involving contact with hazardous chemicals will be considered operations that require Personal Protective Equipment (PPE). A detailed description of the PPE required is presented in Section 6.1.

The applicability of this HASP extends to all personnel who enter the Site, including State and Federal Agency personnel, Conestoga-Rovers and Associates (CRA) employees, subcontractors, and visitors to the Site.

CRA will provide all subcontractors with a copy of this HASP as a means to provide information regarding potential Site hazards. Subcontractors who will work with CRA at the Site will be required to adhere to this HASP and will submit a letter stating the above to CRA prior to commencing Site work.

CRA shall be responsible for ensuring that this HASP is properly implemented by its personnel and subcontractors, and that all Site activities conducted during the IM program are in compliance with the provisions indicated in this plan. The recommended procedures and protocols outlined in this document may be modified during the course of the activities as additional information is made available during on-Site characterization or from laboratory chemical analyses. These modifications will be issued in the form of revisions to specific pages or sections of the HASP or as addenda to the HASP.

All IM activities at the Site will be conducted in accordance with the provisions of this approved Site-specific HASP. A copy of this HASP and employer-specific Standard Operating Procedures (SOPs) will be maintained at the Site whenever activities are in progress.

1.1 PROJECT ORGANIZATION

CRA will provide both a Site Representative who will direct the day-to-day activities of the ongoing work and an on-Site Health and Safety Officer (HSO) who will be responsible for ensuring compliance with the Site-specific HASP. One individual may fulfill both job functions if so qualified.

Facility Representative

Jess A. Vargo, Process Safety and Environmental Supervisor, is the Delaware City Plant's representative for the project. He will coordinate plant resources and protocols during IM activities with the CRA's Project Manager.

CRA's Project Manager

John A. Garges, P.G., is the Project Manager for the RCRA Corrective Action (CA) Project at the Delaware City Plant. Mr. Garges is a Delaware-licensed geologist with 14 years of experience. Mr. Garges has been the project manager or principal hydrogeologist for RCRA and CERCLA projects in New Castle County and has an in-depth understanding of the subsurface conditions at and in the vicinity of the Site. Mr. Garges works out of CRA's Exton, PA office.

CRA's Health and Safety Coordinator

Vicky Corriveau has over 4 years of professional experience in the Industrial Hygiene/Occupational Health and Safety field. Ms Corriveau has been on numerous sites to perform tasks such as air sampling and noise studies, and has maintained internal health and safety programs involving respirator fit testing and safety training.

2.0 SITE CHARACTERIZATION AND POTENTIALLY HAZARDOUS COMPOUNDS

The Site is located on River Road, near Delaware City, Delaware as depicted in Figure 2.1. Figure 2.2 presents the layout of the Oxychem Delaware City Facility, which manufactures chlorine, caustic soda, and potassium hydroxide by electrolysis of salts using liquid mercury cathodes. The Site is bounded by River Road on the west, Red Lion Creek on the north, tidal marsh and dredge deposits on the east, and Kaneka, Inc. and Motiva to the south. River Road provides access to the Site.

The facility's operations generate hazardous wastes. Management of these wastes currently and in the past has included on-Site disposal in waste impoundments referred to as Solid Waste Management Units (SWMUs). A summary of the contaminants of concern and their related health effects are presented in Table 2.1 of this HASP.

The primary purpose of Table 2.1 is to list the primary chemicals that may be encountered during field activities at the Site. The substances listed have been chosen for informational purposes only, and are intended to provide a framework for the development of relevant exposure information that is easily recognizable by field personnel. This list is not all encompassing, but is meant to serve as a guide for assessing exposure potential, possible routes of exposure, symptoms of overexposure, and relevant chemical-specific and physiologic information. As these chemicals cover all classes of chemicals, the H&S procedures will assure worker safety. OxyChem will revise Table 2.1, as appropriate, through addenda to the HASP during the IM at each unit.

2.1 HAZARD ASSESSMENT

OxyChem and EPA agreed at a November 2, 2000 meeting that the best overall RCRA CA project strategy for the Site is to take a proactive approach through the implementation of IM at selected SWMUs and other areas of concern. The primary goals of the IM are to prevent human exposure at the Site and groundwater releases from the Site. For each of these areas, OxyChem will prepare and submit to EPA an IM workplan and design document. EPA will review and approve these documents prior to any work being performed. OxyChem will then implement the IM through construction and subsequent operations and maintenance. This IM HASP is intended to cover the work activities associated with implementation of the IM. The HASP considers the Phase II RFI Report, the December 15, 2000, Phase II RFI Report

Addendum, EPA's May 11, 2001, final approval letter (with comments) for the Phase II RFI Report.

The following SWMUs and areas of concern for which IMs will be evaluated include:

- Waste Lake 1 (WL-1);
- Waste Lake 3 (WL-3);
- the Sand Blast Grit Area;
- the Stormwater Drainage Channels and Outfalls;
- groundwater downgradient of the Process Area;
- mercury contaminated soil beneath the Process Area;
- sediment in the OxyChem Tributary and near Phase II sampling location SD-6;
- the Old Brine Sludge Landfill;
- the New Brine Sludge Landfill;
- the Chemfix Test Unit; and,
- the Standard Chlorine Pipeline.

The following provides a description of the units and an overview of the IM which will be evaluated. As mentioned earlier, as appropriate an addendum will be prepared detailing the additional tasks and/or alterations to the field tasks presently defined in this HASP.

2.1.1 WASTE LAKE NO. 1

Waste Lake No. 1 (WL-1) is located on the north side of the plant, just west of and adjacent Waste Lake No. 2. It is also adjacent, and south of, Red Lion Creek. WL-1 is a triangular shaped landfill covering approximately 2.3 acres. The dimensions of WL-1 are approximately 500 feet along the south side, 400 feet along the east side, and 650 feet along the northwest side. WL-1 has a 20-foot high dike at its north end (adjoining Red Lion Creek) which prevents encroachment of a 100-year flood and has a bearing capacity for vehicles of up to 6,000 pounds. The landfill has been capped with 12 to 24 inches of clay and 4 inches of topsoil. Drainage from the capped surface is through a culvert located in the northeast corner of this unit. The culvert carries stormwater to the Red Lion Creek floodplain.

During its operation, WL-1 received PVC solids, barium, sulfate, calcium sulfate, sulfides, carbonates, chlorides, and mercury in various states and forms. Waste streams that have flowed to the lake also included caustic railroad tanker and truck washings,

cooling tower blowdown, and other general plant washdowns. According to the EPA, the unit has a waste capacity of approximately 35,000 cubic yards.

Historical and recently collected data during implementation of the WL-1 IM Work Plan reveal elevated levels of mercury and chlorobenzenes in the waste material in the unit and groundwater downgradient (northwest) of this unit. In August 2000, OxyChem submitted to EPA an IM design document for the WL-1. The IM design for WL-1 includes a barrier and phytoremediation component.

2.1.2 WASTE LAKE NO. 3

WL-3 (also called the PVC Landfill) is located between two railroad tracks that service the plant approximately 200 feet southwest of WL-1 and directly north of the Old Brine Sludge Landfill.

This impoundment covers about 3.1 acres. It has an elongated shape, oriented in an east-west direction. It is approximately 700 feet long, and 100 to 150 feet wide. The average depth to the base of this landfill is 10 feet. The unit has been closed by installing a low permeability soil cap. Surface water drainage from the cap occurs through a drain pipe at the southeast end of the impoundment. The drain pipe discharges to the Red Lion Creek floodplain.

WL-3 was constructed to receive wastes from the PVC processing area. This unit received approximately 35,000 cubic yards of PVC grit and PVC biosludge. OxyChem has recommended to EPA the elimination for any IM at WL-3.

2.1.3 SAND BLAST GRIT AREA

The Sand Blast Grit Area was identified by DNREC during a Site inspection in August 1996. This area is located outside and behind the Anhydrous Warehouse. It is used for the sand blasting of metal components as part of plant maintenance activities. The area is approximately 50 feet by 75 feet in size. Metal components are either placed directly on the ground or on metal stands during the blasting process. A thin layer of spent black, mineral sand grit covers the area.

Phase II RFI data shows some elevated constituents present in the sand blast grit residue at the Sand Blast Grit Area. OxyChem tests the grit residue prior to off Site disposal. The majority of the grit residue has tested non-hazardous under RCRA. A concrete pad

has been constructed at the Sand Blast Grit Area. Currently, sand blasting is performed on the concrete pad and any grit residue is then collected and disposed of off Site.

OxyChem will review this design, propose additional construction (if deemed necessary), evaluate the health and safety procedures of the personnel performing this work, and document this information as an interim measure for this unit.

2.1.4 STORMWATER DRAINAGE CHANNELS AND OUTFALLS

The stormwater drainage channels (ditches) are located along the perimeter of the facility. Since 1965, when the plant was built, the ditch has received stormwater runoff from the facility. Within the active production area, stormwater runoff outside of containment areas is collected by several stormwater inlets and drain lines that convey the flow to the open ditch along the north side of the facility.

Mercury and other chemicals have been detected in the material (sediment) that is present in the stormwater drainage channels. OxyChem submitted an IM Work Plan to EPA on September 9, 2000 for the Stormwater Drainage Channels and Outfalls. This IM consists of excavation and disposal of the sediments in the stormwater drainage channels.

2.1.5 GROUNDWATER DOWNGRADIENT OF THE PLANT PROCESS AREA

The Process Area includes the operational chemical manufacturing portion of the OxyChem Delaware City facility, including the Former Carbon Tetrachloride Area, Chemfix Test Unit, and Wastewater Treatment Plant.

Phase II RFI results revealed elevated mercury concentrations in the groundwater downgradient of the Plant Process Area. Mercury is present in the downgradient monitoring wells from the production area. Mercury concentrations are highest in the monitoring wells located along the northern production area boundary (A-34S, 270 ug/L; A-34D, 560 ug/L; A-35S, 32 ug/L; A-35D, 96 ug/L) and decline further to the north (i.e., downgradient) in the Chemfix Test Unit area (A-27S, 26 ug/L; A-27D, 1.1 ug/L). Further downgradient, surface water, sediment, and stream piezometers samples collected from the OxyChem tributary to Red Lion Creek show elevated levels of mercury (SW-8, 23 ug/L; SD-8, 140 mg/kg; PZ-8, 0.89 ug/L, respectively). Mercury was detected in some but not all of the sediment samples taken from Red Lion Creek (maximum of 1.3 mg/kg at SD-4). Dissolved mercury was not detected in the Red Lion

Creek piezometer samples and was detected in only one Red Lion Creek surface water sample (SW-9, 0.25 ug/L). The sediment concentrations in Red Lion Creek are consistent with the sediment concentration at the background location SD-1.

Carbon tetrachloride concentrations show a similar distribution. Carbon tetrachloride concentrations are highest downgradient of the process area (A-34S, 330 ug/L; A-34D, 70 ug/L) and decline further to the north at the Chemfix Test Unit area (A-27S, 97 ug/L; A-27D, 41 ug/L). Surface water, sediment, and stream piezometer samples collected from the OxyChem tributary showed even lower carbon tetrachloride concentrations (SW-8, 27 ug/L; SD-8, ND; PZ-8, ND). Carbon tetrachloride was not detected in the Red Lion Creek surface water, sediment, and stream piezometer samples.

These data imply that the production area is a source of dissolved mercury and carbon tetrachloride in the groundwater immediately downgradient of the production area.

OxyChem plans to implement an IM for the groundwater downgradient of the Plant Process Area. For groundwater downgradient of the process area, we envision comprehensive in-situ groundwater control (e.g., reactive wall, funnel-and-gate system).

2.1.6 SOIL BENEATH THE PLANT PROCESS AREA

The Process Area includes the operational chemical manufacturing portion of the OxyChem Delaware City facility, including the Former Carbon Tetrachloride Area, and Wastewater Treatment Plant. Historical plant operation and investigation data revealed elevated mercury concentrations in the soil beneath the Plant Process Area.

Access to the Process Area is limited to plant personnel and escorted visitors. The purpose of this procedure is to prevent worker exposure to mercury and other chemicals during excavation, to define handling and disposal methods for excavated materials and for water removed from the excavation, and to document permits, completion forms, and analytical data for excavation activities. OxyChem will prepare a SOP that will cover future construction projects in the plant process area. This SOP will include a Health and Safety Plan, provisions to remove and properly treat visibly mercury contamination encountered during such projects. OxyChem has existing health and safety procedures for such projects and is presently the only OSHA Star certified facility in the State of Delaware. These health and safety procedures will be reviewed and formalized in the IM Workplan with respect to the RCRA CA project at the Site. OxyChem's proposed SOP for the plant process area will meet the goal of controlling human exposure. The

SOP will assure that all construction projects follow the same procedures, including the correct sign-off by OxyChem's environmental project manager and oversight personnel.

2.1.7 OXYCHEM TRIBUTARY AND SD-6

The OxyChem tributary flows from east to west immediately north of the plant process area and Waste Lake 1 within the marsh. It then turns north at Waste Lake 1 and flows north-northeast to Red Lion Creek. Based on its location, the OxyChem tributary is the primary discharge location for shallow groundwater at the Site. It receives groundwater flowing beneath both the process area located on the west side of the paleochannel axis and Waste Lake 1 located on the east side of the paleochannel axis.

Mercury and chlorobenzenes were detected in the OxyChem Tributary during the Phase II RFI as well as historical investigations. Comparison of Phase II groundwater, surface water, sediment, and piezometer results to the risk screening values for the OxyChem tributary shows VOCs, SVOCs, and mercury above the ecological and human health screening levels. Benzene and chlorobenzene are the primary VOCs downgradient of Waste Lake 1, while carbon tetrachloride is the primary VOC downgradient of the Process Area. Dichlorobenzenes are the primary SVOC of concern downgradient of both of these areas. Likewise, elevated mercury concentrations were detected downgradient of both the Process Area and Waste Lake 1.

OxyChem will submit an IM Work Plan for the OxyChem Tributary, including the contiguous marsh area downgradient of Waste Lake 1 and a separate area near Phase II sediment sample SD-6 as shown in Figure 2.2. As per EPA's recommendation, OxyChem envisions the use of thermal difference data acquired from temperature measurements in the sediment to evaluate groundwater upwelling. Sediment samples will also be collected for mercury and chlorobenzenes. Potential interim measures include dredging or a mat to cover the sediments.

2.1.8 OLD BRINE SLUDGE LANDFILL

The Old Brine Sludge Landfill (Anhydrous Brine Sludge Landfill) is located directly east of the plant processing facility and approximately 20 feet south of WL-3, at its western end. It is bordered on its north, south, and east sides by bermed railroad spurs that service the plant. This unit is situated in a former channel of a small, northward flowing tributary of Red Lion Creek.

The Old Brine Sludge Landfill is approximately 3.2 acres in size and contains sludge waste approximately 10 feet thick. It is about 500 feet long and 300 feet wide, and elliptical in shape, trending in a north-south direction. The waste in this unit has been covered with soils excavated during construction of the New Brine Sludge Landfill. The cover consists of 12 to 30 inches of low-permeability soil and 4 to 6 inches of topsoil, which is vegetated. Drainage from the closed surface of this unit occurs via a drain pipe that discharges to Red Lion Creek.

The estimated maximum volume of waste received in the Old Brine Sludge Landfill is 32,000 cubic yards. The wastes disposed in this unit consisted of mercury-contaminated brine sludges resulting from the removal of inorganic impurities during electrolysis of the salt brine solution.

OxyChem will evaluate the need for interim measures at the Old Brine Sludge Landfill. It is unknown what remedial measures may be implemented at this unit.

2.1.9 NEW BRINE SLUDGE LANDFILL

The New Brine Sludge Landfill (RCRA Landfill) is located south of the Old Brine Sludge Landfill. It is topographically separated from the older landfill by a railroad berm and roadway. This landfill is adjacent to the properties owned by Keneka to the west and Star to the south and east. This SWMU occupies a depression which was originally the course of a small, north-flowing tributary of Red Lion Creek.

This SWMU consists of two landfill cells, which cover a combined area of about 4 acres with an average depth of 8 feet. Cells No. 1 and No. 2 are separated and completely contained by synthetic liners.

Ninety percent of the wastes placed in Cells No. 1 and No. 2 is brine sludge from inorganic impurities that was removed during the salt purification process. These impurities contain mercury used in the electrolysis process, and are identified as hazardous for mercury by EPA code number K-071. The sludge contains approximately 100 mg/kg of mercury. The remaining 5 percent of the sludge is mercury treatment filter cake (diatomaceous filter cake) and lamella bottoms sludge from the wastewater treatment process, which contains about 0.1 to 1.0 percent mercury (Hg) and mercury-sulfide (HgS). This waste is listed as hazardous for mercury under EPA waste code number K-106. A small amount of miscellaneous mercury contaminated wastes (D-009) has also been placed in these cells.

OxyChem will evaluate the need for interim measures at the New Brine Sludge Landfill. It is unknown what remedial measures may be implemented at this unit.

2.1.10 CHEMFIX TEST UNIT

The Chemfix Test Unit is located beyond the northern fenceline of the plant processing area, just east of Oriole Chemical Carriers, on a hill approximately 15 feet above normal plant elevation. It covers an area approximately 100 feet by 60 feet.

This unit was excavated and filled during pilot tests for development of a fixation process for mercury-laden brine sludge. Four test cells (each 25 feet by 60 feet), plus a start-up basin and surge basin, were constructed. Individual test cells were lined with polyethylene film. Perforated PVC pipe was placed at the base of each cell to collect leachate samples for test purposes. Approximately 100,000 gallons of mercury-laden brine sludge and 18,000 gallons of mixed brine and PVC bio-plant sludge (2 to 1 ratio) were pumped to the Chemfix Unit where they were treated and placed. The wastes were treated with dry Portland cement and liquid sodium silicate. The cells have subsequently been covered with native materials and vegetated. The stabilized materials are still in place and the PVC leachate collection pipes have been filled with grout.

OxyChem will evaluate the need for interim measures at the Chemfix Test Unit. It is unknown what remedial measures may be implemented at this unit.

2.1.11 STANDARD CHLORINE PIPELINE

The Standard Chlorine Pipeline runs in a north-south direction along the western edge of the OxyChem property, and then east-west across the northern portion of the developed OxyChem property and carries treated effluent from SC (Metachem is the current owner of the SC property) to a discharge point at the Delaware River. The pipeline is presently constructed of 8-inch cast iron pipe from the SC property to OxyChem's stormwater Outfall 005 at the western end of Waste Lake 1, 10-inch HDPE pipe to just east of Waste Lake 1, and 8-inch HDPE to its discharge point at the Delaware River. Based on the engineering details, the pipeline is located a few feet below grade along much of the pipeline that extends from the western end of the Process Area to the Delaware River.

Historically, the pipe consisted of FRP pipe that carried untreated effluent to Waste Lake 1 from 1965 to 1971, and then on to Waste Lake 2 until 1974. In 1974, the pipeline was re-routed around the southern edge of Waste Lake 1 directly to the Delaware River. The pipeline was upgraded in the late 1970s or early 1980s. At that time, the old FRP pipe was removed and the new pipe was installed in the same trench. Currently, the SC Pipeline is not leaking and, therefore is not acting as a source. Furthermore, the pipeline carries treated water that is regulated under an NPDES permit.

The SC Pipeline was identified as an area of concern in 1986 during a site inspection. Surface and subsurface soil sampling was conducted during Phase I and II. A soil gas survey performed during Phase I identified several areas along the pipeline at which additional investigation was warranted. The Phase II results indicated soil and groundwater contamination above EPA risk-based screening criteria along the SC Pipeline near borings SB-12 and SB-13. Consequently, EPA has requested an evaluation to determine the need for additional investigation and possibly an IM in this area. Based on a review of the existing data, additional sampling is required to determine the nature and extent of the chemicals at the pipeline located south of borings SB-12 and SB-13.

3.0 BASIS FOR DESIGN

Regulations set forth by OSHA in Title 29, Code of Federal Regulations, Parts 1910 and 1926 (29 CFR 1910 and 1926) form the basis of this HASP. Emphasis is placed on Sections 1926.65 (Hazardous Waste Operations and Emergency Response), 1910 Subpart I (Personal Protective Equipment), 1910 Subpart D (Occupational Health and Environmental Controls), and 1910 Subpart Z (Toxic and Hazardous Substances). In addition, current Threshold Limit Values (TLVs) formulated by the ACGIH have been considered in the development of the selection of PPE. Some of the specifications within this section supplement the OSHA regulations and reflect the positions of the United States Environmental Protection Agency (USEPA), the National Institute for Occupational Safety and Health (NIOSH), and the United States Coast Guard (USCG) regarding safe operating procedures at hazardous waste sites.

The health and safety of the public and Site personnel and the protection of the environment will take precedence over cost and schedule considerations for all project work.

4.0 RESPONSIBILITIES AND ADMINISTRATION

The Site Representative shall be responsible, along with the HSO, for all decisions regarding operations and work stoppage due to health and safety considerations. The HSO will have prior experience in working at hazardous waste sites.

The on-Site HSO responsibilities include:

- i) supervision and enforcement of safety equipment usage, including the required use of extra equipment, if appropriate;
- ii) supervision and inspection of equipment cleaning;
- iii) supervision of decontamination activities;
- iv) conduct the on-Site personnel safety indoctrination session for potential hazards, personal hygiene principles, confined space entry procedures, all other SOPs, safety equipment usage, emergency procedures, and location of first aid kits;
- v) maintenance of the Exclusion Zone (EZ) and Contaminant Reduction Zone (CRZ) work areas;
- vi) review and modification of the HASP as more information becomes available or conditions warrant;
- vii) ensure all contractor/subcontractor confined space entry and hot work permits are obtained (as required) from OxyChem Site Representative;
- viii) authority to suspend work activity due to unsafe working conditions and submit documentation to OxyChem;
- ix) ensure all contractors/subcontractors entering the Site are properly orientated/trained regarding the Plant's rules and regulations;
- x) coordination of emergency procedures in conjunction with the OxyChem Site representative;
- xi) implementation of the on-Site air monitoring program;
- xii) ensuring that all on-Site personnel have obtained the required medical examination prior to arrival at the Site, have met the OSHA training requirements, and have been fit tested for the respiratory equipment they may use;
- xiii) maintenance of the on-Site Hazard Communication Program including copies of Material Safety Data Sheets (MSDSs);
- xiv) conducting brief daily safety meetings, including implementation of the HASP upon initiation of Site work;

- xv) providing instruction to Site personnel regarding operating procedures, hazards, and safeguards of tools and equipment when necessary to perform their job;
- xvi) assuring that safety equipment is provided, maintained, and accessible to Site personnel;
- xvii) maintaining a log with sign in/out sheet for personnel performing activities and visitors entering the work area;
- xviii) assuring workers comply with the "buddy system" when working within active work areas;
- xix) ensuring that the following safety equipment is available at all times: portable eyewash, first aid supplies and fire extinguishers; and
- xx) ensuring emergency phone numbers and map to nearest hospital are prominently posted on-Site and in appropriate vehicles.

5.0 WORKER TRAINING AND EDUCATION

CRA will require that all Site personnel, prior to entering work areas, complete training sessions in accordance with 29 CFR 1926.65(e). This training shall consist of a minimum of 40 hours of instruction off site and three days of actual field experience under the direct supervision of a trained, experienced supervisor. Each employer will maintain documentation stating that its on-Site personnel have complied with this regulation

Prior to commencing Site activities, OxyChem, Delaware City requires that all subcontractors undergo "OxyChem specific" drug testing. In addition, Health and Safety/Site Indoctrination Sessions will be presented by OxyChem's safety department and CRA's HSO. Attendance is mandatory for all personnel who will be or who are expected to be involved with project activities.

The training program will stress the importance that each attendee understands the basic principles of personnel protection and safety, be able to perform their assigned job tasks in a safe and environmentally responsible manner, and be prepared to respond in an appropriate manner to any emergency which may arise. The various components of the project HASP will be presented followed by an opportunity to ask questions to ensure that each attendee understands the HASP. Personnel will not be permitted to enter or work in potentially contaminated areas of the Site until they have completed the Site-specific training program. Personnel successfully completing this training program shall sign the HASP Training Acknowledgement Form, which is presented in Appendix A.

In addition, daily "tailgate" safety meetings will take place each day prior to beginning the day's work. All Site personnel will attend these safety meetings conducted by the Site Supervisor and the HSO. The safety meetings will cover specific health and safety issues, Site activities, changes in Site conditions, and a review of topics covered in the Site-specific pre-entry briefing. The safety meetings will be documented with written sign-in sheets containing a list of topics discussed. Appendix B presents the form that will be used for this purpose.

The above training will be given in addition to the basic training required under OSHA and is not intended to meet the requirements of 29 CFR 1926.65. Prior to working in or entering an EZ environment (as defined in Section 6.6), all personnel will be required to provide documentation to the HSO indicating successful completion of the training requirements of 29 CFR 1926.65.

6.0 PERSONAL PROTECTIVE EQUIPMENT (PPE)

This section of the HASP describes the requirements for PPE and the specific levels of protection required for each work task to be conducted at the Site during IM project activities. Basic PPE in all Site areas will consist of hard hats, safety glasses, goggles, hard-toed safety boots/shoes and a chlorine escape respirator.

6.1 PROTECTION LEVELS

Personnel will wear protective equipment when IM project activities involve potential exposure to chemicals from vapors, gases, or particulates that may be generated on Site or when direct contact with potentially hazardous substances may occur. Chemical resistant clothing protects the skin from contact with skin-destructive and absorbable chemicals. Respirators protect lungs, the gastrointestinal tract, and if a full-face respirator is worn, the eyes, against airborne toxicants. Respiratory protection levels will be based on set protection levels for identified tasks.

The specific protection levels to be employed at the Site for each work task are listed in Table 6.1. All project activities conducted at the Site will require the use of one of the following levels of PPE.

Level B (Not Expected to be Worn):

- i) supplied air respirator (Mine Safety and Health Administration [MSHA]/NIOSH approved). Respirators may be positive pressure-demand, self-contained breathing apparatus (SCBA), or positive pressure-demand airline respirator (with escape bottle for Immediately Dangerous to Life and Health [IDLH] or potential IDLH atmosphere);
- ii) polycoated tyvek® or saranex® coveralls;
- iii) steel toe work boots and disposable boot covers or rubber boots;
- iv) disposable nitrile inner gloves;
- v) outer nitrile work gloves;
- vi) hearing protection as necessary; and
- vii) hard hat.

Level C:

- i) tyvek® coveralls (polycoated tyvek® when handling or working with liquids [e.g., decontamination]);
- ii) steel toe work boots and disposable boot covers or rubber boots;
- iii) disposable nitrile inner gloves;
- iv) outer nitrile inner gloves;
- v) full-face air purifying respirator (APR), equipped with combination cartridges for organic vapors and particulates (P-100);
- vi) hearing protection as necessary; and
- vii) hard hat.

Modified Level D:

- i) tyvek® coveralls (polycoated tyvek® when handling or working with liquids);
- ii) steel toe work boots;
- iii) disposable nitrile inner gloves;
- iv) outer nitrile work gloves;
- v) safety glasses;
- vi) splash shields as necessary;
- vii) hearing protection as necessary; and
- viii) hard hat.

Level D:

- i) standard work uniform or coveralls;
- ii) steel toe work boots;
- iii) gloves as necessary;
- iv) safety glasses;
- v) splash shield as needed;
- vi) hearing protection as necessary; and
- vii) hard hat.

PPE will be maintained in a clean sanitary condition and ready for use. Disposable coveralls shall be discarded when torn and as an employee leaves the EZ. Hard hats shall be thoroughly cleaned after leaving the EZ. Respirators shall be cleaned after each

day's use and cartridges discarded. A sufficient quantity of potable water shall be supplied for washing, cleaning PPE, and drinking. A potable water supply for washing and cleaning PPE will be maintained adjacent to the decontamination area described in Section 9.0. Fresh potable water for drinking will be supplied on a daily basis and be maintained at a location removed from the active work area.

6.2 REASSESSMENT OF PROTECTION LEVELS

Protection levels provided by PPE selection shall be upgraded or downgraded based upon a change in Site conditions or the review of the results of air monitoring and initial exposure assessment monitoring program.

When a significant change occurs, the hazards shall be reassessed. Some indicators of the need for reassessment are:

- i) commencement of a new work phase;
- ii) change in job tasks during a work phase;
- iii) change of season/weather;
- iv) when temperature extremes or individual medical considerations limit the effectiveness of PPE;
- v) chemicals other than those expected to be encountered are identified;
- vi) change in ambient levels of chemicals;
- vii) observation of free mercury in excavated soil; and
- viii) change in work scope which effects the degree of contact with areas of potentially elevated chemical presence.

If free mercury is observed in any excavated soil, special procedures and handling requirements will be conducted. These procedures and requirements will include:

- i) withdraw all workers from excavated area;
- ii) barricade work area with yellow "CAUTION – DO NOT ENTER" tape;
- iii) collect soil samples from stockpiled material for analysis for total mercury;
- iv) analysis of the soil sample for total mercury in the OxyChem Delaware City laboratory;
- v) determine the method of segregation of soil containing free mercury for soil prior to treatment and disposal; and,

- vi) upgrade the protection level of all personnel in the excavation area to Level C prior to removal of the yellow tape and resumption of work.

All proposed changes to protection levels and PPE requirements will be reviewed and approved prior to their implementation by the HSO.

6.3 DURATION OF WORK TASKS

The duration of project activities involving the usage of PPE will be established by the HSO based upon ambient temperature and weather conditions, the capacity of personnel to work in the designated level of PPE (heat stress and cold stress, see Section 12.0 - Environmental Control), and limitations of the protective equipment (i.e., ensemble permeation rates, life expectancy of air-purifying respirator cartridges, etc.). As a minimum, rest breaks will be observed at the following intervals:

- i) 15 minutes midway between shift startup and lunch;
- ii) 1/2-hour for lunch; and
- iii) 15 minutes in the afternoon, between lunch and shift end.

All rest breaks will be taken in a clean area (e.g., support zone) after full decontamination and PPE removal. Additional rest breaks will be observed, based upon the heat stress monitoring guidelines presented in the CRA Health and Safety SOPs.

6.4 LIMITATIONS OF PROTECTIVE CLOTHING

PPE ensembles designated for use during project activities have been selected to provide protection against chemicals at known or anticipated concentrations in the waste materials. However, no protective garment, glove, or boot is chemical-proof, nor will it afford protection against all chemical types. Permeation of a given chemical through PPE is a complex process governed by the chemical concentrations, environmental conditions, physical condition of the protection garment, and the resistance of a garment to a specific chemical; chemical permeation may continue even after the source of the chemical has been removed from the garment.

In order to obtain optimum usage from PPE, the following procedures are to be followed by all Site personnel using PPE:

- i) when using disposable coveralls, don a clean, new garment after each rest break or at the beginning of each shift;
- ii) inspect all clothing, gloves, and boots both prior to and during use for:
 - a) imperfect seams,
 - b) non-uniform coatings,
 - c) tears,
 - d) poorly functioning closures; and
- iii) inspect reusable garments, boots, and gloves both prior to and during use for:
 - a) visible signs of chemical permeation,
 - b) swelling,
 - c) discoloration,
 - d) stiffness,
 - e) brittleness,
 - f) cracks,
 - g) any sign of puncture, and
 - h) any sign of abrasion.

Reusable gloves, boots, or coveralls exhibiting any of the characteristics listed above will be discarded. PPE used in areas known or suspected to exhibit elevated concentrations of chemicals will not be reused.

Additional PPE usage guidelines are as follows:

- i) ankles/wrists will be secured tightly with the use of duct tape;
- ii) prescription eyewear used on Site shall be safety glasses equipped with side shields when full-face respirators are not required. Contact lenses shall not be used;
- iii) all EZ workers will have received training in the usage of a half-face and/or full-face air purifying respirators and SCBA which may be required in an emergency;
- iv) steel toe leather footwear shall be covered with neoprene overboots prior to entering the EZ and immediately upon entering the CRZ;
- v) safety footwear and hard hats are to be worn by Site personnel at all times.

- vi) protective gloves (leather palm) will be worn over nitrile gloves by Site personnel involved in drilling activities;
- vii) during periods of respirator usage, respirator cartridges and filters will be changed daily, or upon breakthrough, whichever occurs first;
- viii) during periods of respirator usage, personnel will not be permitted to have beards, or long sideburns or mustaches that interfere with the proper fit of the respirator;
- ix) all PPE worn on Site will be decontaminated or discarded at the end of each work day;
- x) no watches, rings, or other accessories will be permitted during drilling and sampling activities.

EZ personnel also carry certain responsibilities for their own health and safety, and are required to observe the following safe work practices:

- i) familiarize themselves with this HASP;
- ii) use the "buddy system" when working in a contaminated operation;
- iii) use the safety equipment in accordance with training received, labeling instructions, and common sense;
- iv) maintain safety equipment in good condition and proper working order;
- v) refrain from activities that would create additional hazards (i.e., smoking, eating, etc., in restricted areas, leaning against dirty, contaminated surfaces);
- vi) smoking, eating, and drinking will be prohibited except in designated areas. These designated areas may change during the duration of the project to maintain adequate separation from the active work area(s). Designation of these areas will be the responsibility of the HSO; and
- vii) soiled disposable outerwear shall be removed and placed into a covered container prior to washing hands and face, eating, using lavatory facilities, or leaving the Site.

6.5 RESPIRATORY PROTECTION PROGRAM

Prior to arriving at the Site, all on-Site personnel will have received training in the use of, and have been fit tested for a full-facepiece respirator. All on-Site personnel will be required to comply with their employer specific written respiratory protection program developed in accordance with OSHA 29 CFR 1910.134.

Respiratory protection may be required during some of the IM activities. This is to ensure worker protection from particulates with potentially elevated chemical levels and volatile organic compounds (VOCs). Respirators shall be worn during activities that generate dust or particulates.

A “Jerome Mercury Vapor Analyzer” will be used to determine if mercury vapors are present. A photoionization detector (PID) will be used to determine if organic vapors are present. A background reading will be established prior to commencing work activities at each active work area.

Action levels to determine the level of respiratory protection necessary for mercury and/or VOCs during IM activities are based on the concentration of the known Site chemicals measured within the breathing zone. The action levels and appropriate respiratory protection for these Site activities are as follows:

Sustained Organic Vapor Reading Above

Background within Worker Breathing

Zone in parts per million (ppm).

Action taken

<1 ppm above background

have respirator available

1-10 ppm above background

wear full face or ½ face respirator

10-50 ppm above background

must wear full-face respirator

>50 ppm above background

hut down activities, notify HSO,
re-evaluate work plan

Sustained Mercury Vapor Reading Above

Background within Worker Breathing

Zone in milligram per cubic meter (mg/m³).

Action taken

<0.01 mg/m ³ above background	have respirator available
0.1 mg/m ³ above background	must wear full-face respirator
0.5 mg/m ³ above background	shut down activities, notify HSO, upgrade to supplied air

The appropriate air purifying respirator cartridges to be used at the Site are a combination organic vapor and P-100 particulate cartridge for VOCs and Mersorb P-100 particulate cartridge for mercury. The cartridge used must be of the same manufacturer as the respiratory face piece.

6.6 SITE CONTROL

Specific work areas, as defined below, will be delineated by temporary fencing or a flagged line. Designated work areas will be set up as appropriate inside the fence during the Site field activities, as required. The purpose of these procedures is to limit access to areas with potentially elevated chemical presence, and prevent the migration of potentially hazardous materials into adjacent clean areas. These areas are described in the following:

- i) The Exclusion Zone (EZ) is the area immediately surrounding the active work area. This zone will include all areas where potentially contaminated soils or materials are to be handled and all areas where contaminated equipment or personnel travel. Boundaries are modifiable depending on operational requirements. The HSO will be responsible for maintaining the boundaries of this area. Personnel entering this area are required to wear the PPE as defined previously. A wind direction indication device (i.e., flagging, windsock, etc.) will be mounted in the area of any EZ during Site activities.

All personnel (including visitors) entering the EZ or CRZ using respiratory protection must have successfully passed a respirator fit test in accordance with OSHA 29 CFR 1910.134. Documentation of fit testing is the responsibility of each employer.

In the event that unauthorized personnel enter the EZ, work will stop. Work will not resume until the unauthorized personnel have been removed from the EZ or have been moved to an acceptable on-Site area.

- ii) The Contaminant Reduction Zone (CRZ) is the zone that occurs at the interface of the EZ and Support Zone. It provides access for the transfer of construction

materials and Site equipment to the EZ, the decontamination of vehicles prior to leaving the EZ, the decontamination of personnel and clothing prior to entering the Support Zone, and for the physical segregation of the Support Zone and EZ. Supplemental safety equipment, such as fire extinguishers, portable eyewash, and extra quantities of PPE may be stored in this area. The order in which safety equipment is to be donned is as follows:

- a) tyvek[®] suit;
- b) rubber boot;
- c) gloves;
- d) respirator (if required); and
- e) hard hat.

The following order applies when removing safety equipment:

- a) wash off boots and outer gloves prior to removal;
- b) tyvek[®] suit;
- c) hard hat;
- d) respirator; and
- e) inner gloves.

- iii) The Support Zone (SZ) is the portion of the Site defined as the area outside the zone of significant air and soil contamination. The Support Zone will be clearly delineated and procedures will be implemented to prevent active or passive migration of contamination from the EZ or CRZ. PPE beyond standard construction safety equipment is therefore not required.

7.0 ACTIVITY HAZARD/RISK ANALYSIS

This section identifies the general hazards associated with specific project activities and presents the documented or potential health and safety hazards that exist at the Site. Every effort will be made to reduce or eliminate these hazards. Those which cannot be eliminated must be guarded against by use of engineering controls and/or PPE. Table 7.1 presents the anticipated hazards/risks and hazard controls.

In addition to the chemical hazards presented in Section 2.0 of this HASP, physical hazards including slippery surfaces, confined spaces, the use of heavy equipment, the use of decontamination equipment, and potential heat and cold stress at the Site. It will be the responsibility of each on-Site contractor and their personnel to identify the physical hazards posed by the various Site project activities and implement preventative and corrective action.

7.1 CHEMICAL EXPOSURE

Preventing exposure to toxic chemicals is a primary concern. Chemical substances can enter the unprotected body by inhalation, skin absorption, ingestion, or through a puncture wound (injection). A contaminant can cause damage at the point of contact or can act systematically, causing a toxic effect at a part of the body distant from the point of initial contact.

Chemical exposures are generally divided into two categories: acute and chronic. Symptoms resulting from acute exposures usually occur during or shortly after exposure to a sufficiently high concentration of a chemical. The concentration required to produce such effects varies widely from chemical to chemical. The term "chronic exposure" generally refers to exposures to "low" concentrations of a contaminant over a long period of time. The "low" concentrations required to produce symptoms of chronic exposure depend upon the chemical, the duration of each exposure, and the number of exposures. For a given chemical, the symptoms of an acute exposure may be completely different from those resulting from chronic exposure.

For either chronic or acute exposure, the toxic effect may be temporary and reversible, or may be permanent (disability or death). Some chemicals may cause obvious symptoms such as burning, coughing, nausea, tearing eyes, or rashes. Other chemicals may cause health damage without any such warning signs (this is a particular concern for chronic exposures to low concentrations). Health effects such as cancer or respiratory disease may not become manifest for several years or decades after exposure. In addition, some

toxic chemicals may be colorless and/or odorless, may dull the sense of smell, or may not produce any immediate or obvious physiological sensations. Thus, a worker's senses or feelings cannot be relied upon in all cases to warn of potential toxic exposure.

The effects of exposure not only depend on the chemical, its concentration, route of entry, and duration of exposure, but may also be influenced by personal factors such as the individual's smoking habits, alcohol consumption, medication use, nutrition, age, and sex.

An important exposure route of concern at the Site is inhalation. The lungs are extremely vulnerable to chemical agents. Even substances that do not directly affect the lungs may pass through lung tissue into the bloodstream, where they are transported to other vulnerable areas of the body. Some toxic chemicals present in the atmosphere may not be detected by human senses (i.e., they may be colorless, odorless, and their toxic effects may not produce any immediate symptoms). Respiratory protection is therefore extremely important if there is a possibility that the work Site atmosphere may contain such hazardous substances. Chemicals also can enter the respiratory tract through punctured eardrums. Where this is a hazard, individuals with punctured eardrums should be medically evaluated specifically to determine if such a condition would place them at an unacceptable risk and preclude their working at the task in question.

Direct contact of the skin and eyes by hazardous substances is another important route of exposure. Some chemicals directly injure the skin. Some pass through the skin into the bloodstream where they are transported to vulnerable organs. Skin absorption is enhanced by abrasions, cuts, heat, and moisture. The eye is particularly vulnerable because airborne chemicals can dissolve in its moist surface and be carried to the rest of the body through the bloodstream (capillaries are very close to the surface of the eye). Wearing protective equipment, not using contact lenses in chemical atmospheres (since they may trap chemicals against the eye surface), keeping hands away from the face, and minimizing contact with liquid and solid chemicals can help protect against skin and eye contact.

Although ingestion should be the least significant route of exposure at the Site, it is important to be aware of how this type of exposure can occur. Deliberate ingestion of chemicals is unlikely. Chewing gum or tobacco, drinking, eating, smoking cigarettes at the Site is prohibited.

The last primary route of chemical exposure is injection, whereby chemicals are introduced into the body through puncture wounds (i.e., by stepping or tripping and falling onto contaminated sharp objects). Wearing safety shoes, avoiding physical hazards, and taking common sense precautions are important protective measures against injection.

8.0 AIR MONITORING

During the progress of IM project activities, monitoring of organic vapors will be taken by the HSO as necessary. The following air monitoring instrumentation may be required for task-specific IM activities:

- i) a PID detector (equipped with an 11.7(v) lamp);
- ii) a combination oxygen/combustible gas instrument;
- iii) an instrument capable of measuring mercury vapor; and
- iv) an instrument capable of measuring carbon monoxide.

All monitoring equipment will be calibrated on a daily basis in accordance with the manufacturer's guidelines, and such calibrations will be recorded in the Site daily log book. Results of all daily air monitoring also will be recorded in the Site daily log book.

Air monitoring will be conducted continuously in the breathing zone of workers in all EZs which are confined spaces. Background measurements immediately upwind of the EZ will be taken before activities commence.

Immediately upon identifying sustained elevated levels of organic vapors (greater than 50 ppm within the Work Zone), the air monitoring results will be reported to the Site Representative and work activities will be shut down. The HSO will determine the cause of the sustained elevated levels of organic vapors and alternate work methods or engineering controls will be implemented to rectify the release of elevated concentrations of organic vapors, or upgrade levels of PPE as required.

8.1 INITIAL EXPOSURE ASSESSMENT – MONITORING PROGRAM

CRA will comply with OSHA's standards for benzene (CFR 1910.1028) and vinyl chloride (CFR 1910.1017). These standards require that initial air samples be collected during operations where these chemical substances are present in the workplace. The HSO will collect samples from workers who face the greatest potential for exposure to these substances. NIOSH protocol will govern the sampling procedures; samples will be collected and analyzed in accordance with compound specific NIOSH procedures. The samples will be sent to an American Industrial Hygiene Association (AIHA) accredited laboratory for analysis with rush turnaround time for receipt of verbal data.

9.0 DECONTAMINATION PROCEDURES **- CONTAMINATION MIGRATION CONTROL**

In general, all equipment that enters the EZ at the Site must either be decontaminated or properly discarded upon exit from the EZ. All personnel, including any State and local officials, must enter and exit the EZ through the decontamination area. Prior to demobilization, potentially contaminated equipment will be decontaminated and inspected by the HSO before it is moved into the clean zone.

The type of decontamination solution to be used is dependent on the type of chemical hazards. The decontamination solution for this Site is Alconox (soap) for equipment and for any reusable PPE. Other solvents (i.e., isopropanol) will be used for equipment cleaning. Material Safety Data Sheets (MSDS) for Alconox and all other chemical containing products will be maintained at the Site by the HSO.

9.1 EQUIPMENT DECONTAMINATION PROCEDURES

All equipment must be decontaminated within the CRZ or on the decontamination pad by a pressure washer upon exit from the EZ. Decontamination procedures should include: knocking soil/mud from machines; water rinsing using a solution of water and Liquinox; scraping and brushing to remove remaining soils and a final water rinse. Personnel shall wear Level C protection when decontaminating equipment and vehicles.

Prior to mobilization, all sampling equipment will be thoroughly cleaned using a pressurized low-volume water wash or steam clean to remove oil, grease, mud, and other foreign matter. In addition, before initiating drilling at each location, the samplers and associated downhole equipment will be thoroughly cleaned at a designated wash station to prevent potential cross-contamination from the previous drilling location. Prior to removal from the working area, sampling equipment will have loose mud removed and will then be transported to the decontamination facility. The equipment will be inspected by the HSO after cleaning and prior to initiation of sampling, and shall be included in the Site log book.

All equipment used for the collection of samples for chemical analysis will be cleaned according to the following protocol:

- wash and scrub with non-phosphate detergent (e.g., Alconox);
- tap water rinse and steam clean;
- rinse with isopropanol;

- thorough rinse with deionized distilled water;
- air dry; and
- wrap in aluminum foil for transport.

Tap water may be used from any municipal water treatment system. The use of an untreated non-potable water supply is not an acceptable substitute.

All cleaned equipment will be placed on polyethylene sheeting or aluminum foil in order to avoid contacting a contaminated surface before use.

Washwaters will be containerized and temporarily staged on Site. The containerized water will be tested prior to discharge to the on-Site Wastewater Treatment Plant.

9.2 PERSONNEL DECONTAMINATION PROCEDURES

Personnel decontamination will be completed in accordance with the CRA Health and Safety SOP for personnel decontamination.

10.0 GENERAL SAFETY AND PERSONAL HYGIENE

1. Eating at the Site is prohibited except in specifically designated areas. Designation of eating areas will be the responsibility of the HSO. The location of these areas may change during the duration of the project to maintain adequate separation from the active work area(s).
2. Smoking at the Site is prohibited.
3. Individuals getting wet to the skin with effluent from the washing operation must wash the affected area immediately. If clothes in contact with skin are wet, then these must be changed.
4. Hands, face, neck, and other exposed areas must be washed with soap and water before eating, drinking, smoking, before using toilets, and before leaving the Site.
5. All disposable coveralls and soiled gloves will be placed in covered containers at the end of every shift or sooner, if deemed necessary by the HSO. Wastes will be stored until proper disposal arrangements have been made.
6. Personnel working on Site will not be permitted to wear facial hair that interferes with the mask-to-face seal on air-purifying respirators.
7. All personnel performing or supervising work within the Exclusion Zone must wear appropriate PPE, observe, and adhere to the personal hygiene-related provisions of this section.
8. Personnel found to be disregarding the personal hygiene-related provisions of this HASP will, at the discretion of the HSO, be barred from the Site.

10.1 HEALTH AND SAFETY VIOLATION POLICY

Health and safety procedures have been established by OxyChem, Delaware City to protect Site personnel and to prevent the spread of substances of concern. Therefore, it is imperative that all personnel adhere to the procedures outlined in this HASP and those issued by the HSO. Because of the potentially grave consequences as a result of personnel not complying with the health and safety procedures, a worker dismissal policy has been established.

CRA's employees and subcontractor employees are subject to Site dismissal by the HSO or his designated representative based on three health and safety violation of any nature. Equivalent protocol shall be observed by all visitors to the Site. The procedure, outlined below, is applicable to all Site personnel, regardless of position.

1st Violation – The worker is verbally instructed in the proper procedure and the offense is noted in the health and safety file. The worker's foreman or immediate supervisor is given written notice of these actions within 24 hours.

2nd Violation – The worker is verbally instructed in the proper procedure and warned that the next offense will constitute grounds for dismissal. The offense and warning are noted in the health and safety file. The worker's foreman or immediate supervisor will be given written notice of these actions within 24 hours.

3rd Violation – The worker is given verbal and written instruction to depart the Site following proper termination procedures (i.e., the turning in of company gear, reporting to foreman, setting up exit physical, etc.). The violation and termination action is noted in the health and safety file. The worker's foreman or immediate supervisor will receive immediate verbal notice and written notice within 24 hours of the dismissal.

If an employee wishes to contest a violation ruling, the employee shall do so through his/her foreman or immediate supervisor. The HSO or designated representative shall consider all points and either keep or rescind the original ruling.

11.0 MEDICAL SURVEILLANCE

In accordance with the requirements detailed in 29 CFR 1926.65 and 29 CFR 1910.134, all Site personnel who will come in contact with materials with potentially elevated chemical presence will have received, within 1 year prior to starting field activities, medical surveillance by a licensed physician or physician's group.

Medical records for all on-Site personnel will be maintained by their respective employers. The medical records will detail the tests that were taken and will include a copy of the consulting physician's statement regarding the tests and the employee's suitability for work.

The medical records will be available to the employee or his/her designated representative upon written request, as outlined in 29 CFR 1910.1020.

Each employer will provide certifications to the HSO that its personnel involved in Site activities will have all necessary medical examinations (including a pulmonary “able to wear “ test) and will have obtained medical certification prior to commencing work, which requires respiratory protection or potential exposure to hazardous materials. Personnel not obtaining medical certification will not perform work within the CRZ and EZ.

Interim medical surveillance will be completed if an individual exhibits poor health or high stress responses due to any Site activity or when accidental exposure to elevated concentrations of chemicals occur.

12.0 ENVIRONMENTAL CONTROL PROGRAM

This section of the HASP outlines measures to be implemented at the Site to prevent hazards associated with environmental conditions.

12.1 WEATHER MONITORING

The HSO or Site Superintendent will be responsible for checking weather forecasts for the next day and week of work to provide advance notification of any severe weather conditions. Severe weather conditions (e.g., heavy rains) may cause unsafe conditions at the Site and in some situations work may have to be stopped.

12.2 RAIN AND SNOW

Excessive amounts of precipitation may cause potential safety hazards for all work tasks. The hazards would be most commonly associated with slipping, tripping, or falling due to slippery surfaces and further hazards are detailed by work task (see Table 7.1).

Severe weather conditions will result in work stoppage and the implementation of further emergency measures, as described in the CRA Health and Safety SOP.

12.3 TEMPERATURE

The IM activities are expected to be conducted throughout the year. Low and high temperatures may be experienced which require measures to be implemented to prevent health and safety hazards from occurring. Potential hazards arising from temperature extremes are heat stress and cold exposure.

The potential hazard due to worker heat stress is particularly important if high protection levels of PPE are in use (e.g., respirators). A detailed monitoring program and prevention measures to implement to reduce heat stress are detailed in CRA Health and Safety SOPs. It is the responsibility of the HSO to determine which measures are appropriate to implement to prevent heat stress; these will depend largely on daily Site conditions.

Exposure to cold is similar to heat stress in that the HSO must determine the appropriate preventive measure to implement. Some of the measures which may be implemented include: more frequent breaks, additional clothing, and partial enclosure of work areas. Detailed cold exposure prevention methods are also included in CRA Health and Safety SOPs.

Some of the measures which may be implemented include: more frequent breaks, additional clothing, and partial enclosure of work areas. Detailed cold/heat exposure prevention measures are also included in CRA Health and Safety SOPs.

12.4 WIND

High winds may be encountered at the Site and these can cause hazards that may affect Site personnel health and safety. Preventative measures that will be implemented if necessary are as follows:

- i) restricted Site activity;
- ii) battening down light equipment or building materials;
- iii) partially enclosing work areas; and
- iv) reduction or stoppage of work activities.

13.0 CONFINED SPACE ENTRY PROCEDURE

A confined space provides the potential for unusually high concentrations of contaminants, explosive atmospheres, oxygen deficient atmospheres, limited visibility, and restricted movement. This section establishes requirements for safe entry into, continued work in, and safe exit from confined spaces. Additional information regarding confined space entry can be found in 29 CFR 1926.21, 29 CFR 1910.146, and NIOSH-106. At this Site, confined spaces may be encountered during construction activities, (though entry is not expected to occur during IM activities). Entry into a confined space will only be undertaken after remote methods have been tried and found not to be successful. If confined space entry is required, such work will only be undertaken following the guidelines presented in either the contractor's confined space entry program or CRA's Health and Safety SOPs for Confined Space Entry.

14.0 EMERGENCY RESPONSE

It is essential that Site personnel be prepared in the event of an emergency. Emergencies can take many forms: illnesses or injuries, chemical exposure, fires, explosions, spills, leaks, releases of harmful contaminants, or sudden changes in the weather. The following sections outline the general procedures for emergencies. Emergency information should be posted as appropriate. All emergencies will be reported to the OxyChem's, Delaware City Site representative who will give CRA further direction as to the responsibilities during any emergency situation. In the absence of direction from the Oxy Representative, the procedures identified in the following sections will apply.

14.1 EMERGENCY CONTACTS

Fire:	911
Fire (from any phone within the Plant):.....	3938
Police:	911
Police (from any phone within the Plant):.....	3858
Ambulance:	911
Ambulance (from any phone within the Plant):	3858
Hospital:.....	(302) 733-1000

You must dial "9" for an outside line from any of the phones at the facility.

Christiana Care Health Systems
4755 Ogletown – Stanton Road
Newark, Delaware 19718

Directions to the Hospital:

Go Northeast on River Road/DE-9 towards Hamburg Road by turning RIGHT from Site entrance/exit. Turn LEFT onto Hamburg Road. Go through stoplight and cross over Route 13. Approximately 200 feet after stop light, turn LEFT and merge onto Route 1 North. Take Route 1 North (also known as Stanton Christiana Road/DE-7 North) for approximately 5 miles and cross under Route I-95. Continue on Route 1 North and turn LEFT onto Churchmans Road/DE-58 West. Churchmans Road/DE-58 West becomes an unnamed road. Turn LEFT onto Ogletown Stanton Road/DE-4 East and follow to Christiana Hospital.

Appendix C provides the route to the Christiana Hospital.

14.2 ADDITIONAL EMERGENCY NUMBERS

National Response Center (NRC)	800-424-8802
National Poison Center.....	800-722-7112
USEPA Region 3	800-438-2474
USEPA Project Manager (Donna McCartney).....	215-814-3427
State of Delaware (DNREC).....	302-395-2602
OxyChem Plant (DE) Construction Superintendent (Steve Opdenaker)	302-834-3944
OxyChem Plant (DE) Process Safety & Environmental Supervisor (Jess Vargo)	302-834-3831
CRA Project Manager (John Garges)	610-280-0277
CRA Industrial Hygienist (Vicky Corriveau)	610-280-0277
CRA Site Representative (to be determined)	
CRA On-Site HSO (to be determined).....	

You must dial "9" for an outside line from any of the phones at the facility.

14.2.1 SITE COMMUNICATION

Walkie-Talkies – Hand held units may be utilized as needed by field teams for communication between downrange operations and the HSO and Support Zone. Likewise, OxyChem Plant walkie-talkies may be used by field teams to communicate with main gate.

Telephones – Telephones are available at certain locations throughout the Plant for communication with emergency support services and facilities. The closest phone to the specific IM work tasks that will be performed shall be identified prior to commencing work.

Hand Signals – To be employed by downrange field teams, along with utilizing the buddy system. These signals are also very important when working with heavy equipment where audio contact may be difficult or impossible.

Hand Signals shall be known by the entire field team before operations commence and will be covered during Site-specific training and briefings.

Hand signals to be used, and their meanings:

- Hand gripping throat – out of air; cannot breathe;
- Grip partners wrists or place both hands around waist – leave immediately;
- Hands on top of head – need assistance;
- Thumbs up – Ok, I am all right; I understand;
- Thumbs down – no; negative

OxyChem Plant Emergency Alarms –

Fire: 60 second sounding of alarm

Chlorine: 5 second sounding of alarm, sounding every 5 seconds for one minute

14.3 EMERGENCY EQUIPMENT AVAILABLE ON SITE

Safety equipment will be available for use by Site personnel and will be located and maintained at the Site. The safety equipment will include, but is not limited to, the following:

Communication Equipment

Emergency Alarms/Horns

Location

CRZ

Medical Equipment

OSHA Approved First Aid Kit

Sized for a Minimum of 20 people

Portable Emergency Eyewash

CRZ or Support Zone

Fire Fighting Equipment

Two 20-Pound ABC Type Dry Chemical Fire Extinguishers

Two SCBAs

CRZ

14.4 PROJECT PERSONNEL RESPONSIBILITIES DURING EMERGENCIES

HEALTH AND SAFETY OFFICER (HSO)

As the administrator of the HASP, the HSO has primary responsibility for responding to and correcting emergency situations. The HSO will:

- i) take appropriate measures to protect personnel including: withdrawal from the EZ, total evacuation and securing of the Site or upgrading or downgrading the level of protective clothing and respiratory protection;
- ii) take appropriate measures to protect the public and the environment including isolating and securing the Site, preventing runoff to surface waters and ending or controlling the emergency to the extent possible;
- iii) ensure that OxyChem's Site Representative, the appropriate Federal, State, and local agencies are informed, and emergency response plans are coordinated. In the event of fire or explosion, the local fire department should be summoned immediately. In the event of an air release of toxic materials, the local authorities should be informed in order to assess the need for evacuation. In the event of a spill, sanitary districts and drinking water systems may need to be alerted;
- iv) ensure that appropriate decontamination treatment or testing for exposed or injured personnel is obtained;
- v) determine the cause of the incident and make recommendations to prevent the recurrence; and
- vi) ensure that all required reports have been prepared.

14.5 MEDICAL EMERGENCIES

In the event of injury to on-Site personnel, the following protocol will be followed:

- notify the Health and Safety Officer and OxyChem's Site Representative;
- evacuate all personnel upwind;
- exit Site;
- contact the designated hospital and describe the injury;
- decontaminate personnel if possible, and administer appropriate first aid. If personnel cannot be decontaminated, alert hospital to possible problems of contamination; and
- transport personnel to the medical facility.

Any person who becomes ill or injured in the EZ must be decontaminated to the maximum extent possible. If the injury or illness is minor, full decontamination should be completed and first aid administered prior to transport. If the patient's condition is serious, at least partial decontamination should be completed as much as possible without causing further harm to the patient. First aid should be administered while

awaiting an ambulance or paramedics. All injuries and illnesses must immediately be reported to the HSO and Site Superintendent.

Any person transporting an injured/exposed person to a clinic or hospital for treatment should take with them directions to the hospital and a listing of the contaminants of concern to which they may have been exposed.

Any vehicle used to transport contaminated personnel will be cleaned or decontaminated, as necessary.

14.6 FIRE OR EXPLOSION

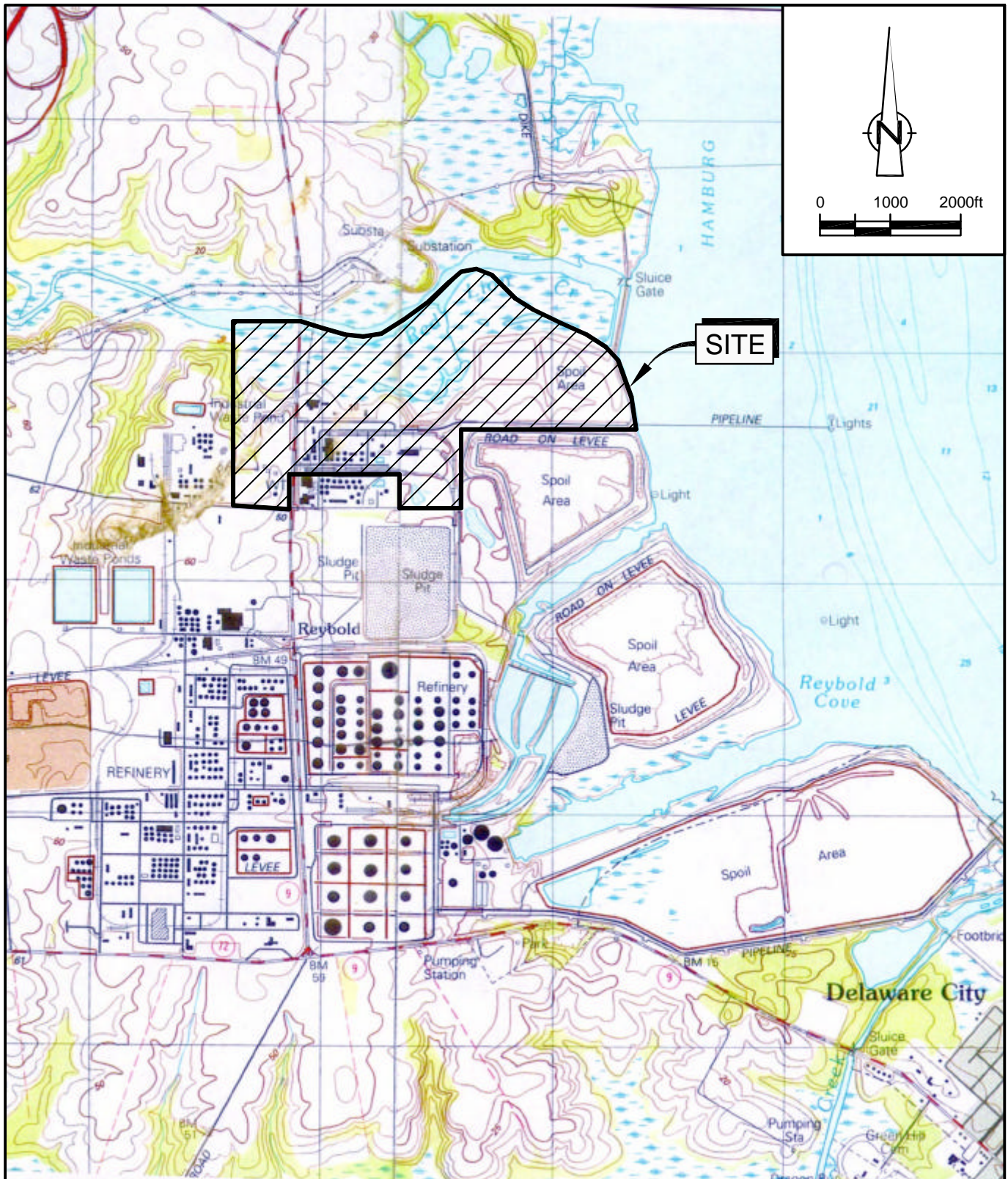
In the event of a fire or explosion, the local fire department should be summoned immediately. Upon their arrival, OxyChem's Site representative will advise the fire commander of the location, nature, and identification of the hazardous materials on Site.

15.0 RECORDKEEPING

The HSO shall establish and maintain records of all necessary and prudent monitoring activities as described below:

- i) name and job classification of the employees involved on specific tasks;
- ii) records of qualitative fit testing and physical examination results for Site personnel;
- iii) records of all OSHA training certification for Site personnel;
- iv) records of training acknowledgment forms; and
- v) emergency reports describing any incidents or accidents.

FIGURES

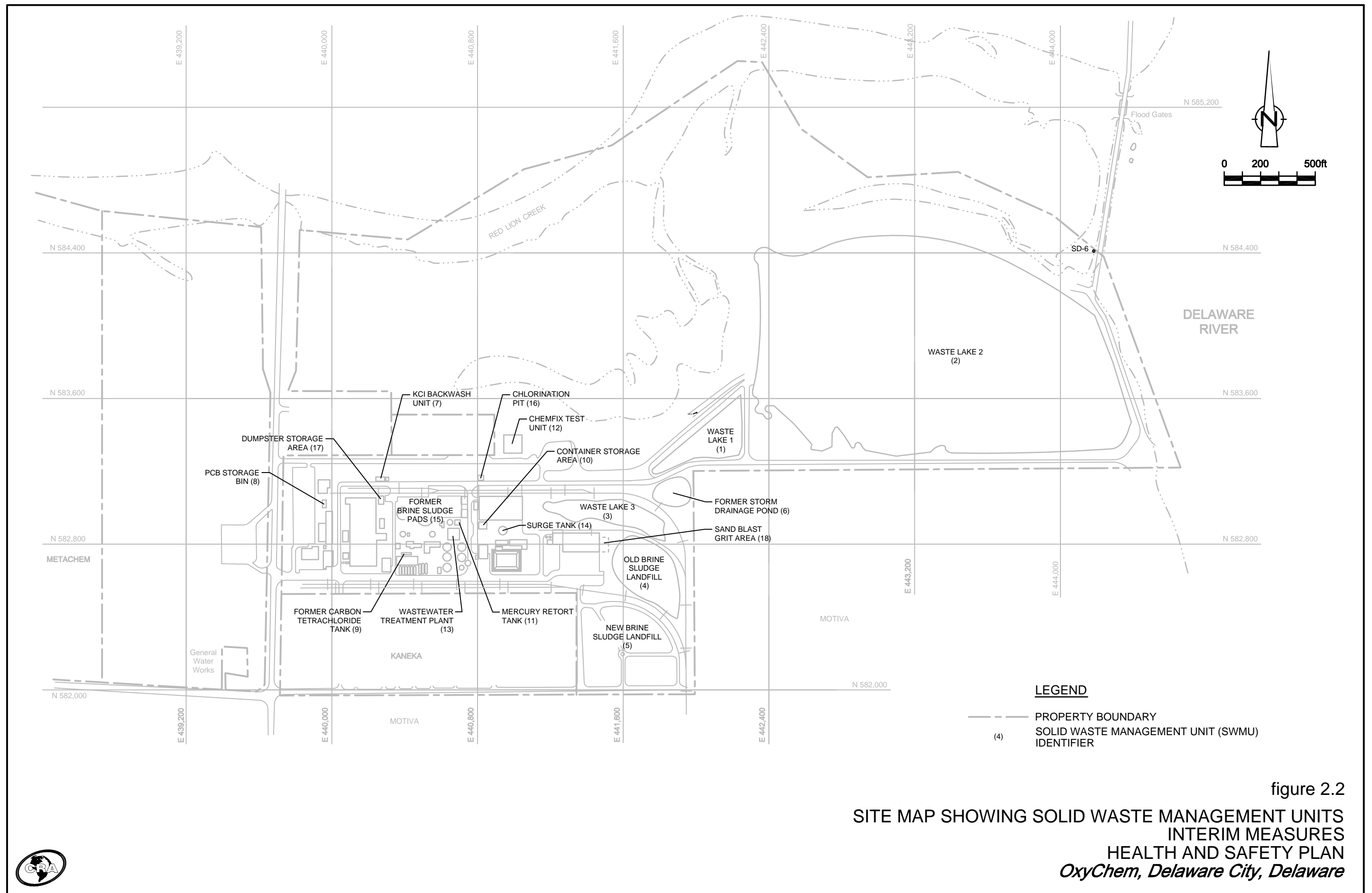


SOURCE: USGS QUADRANGLE MAPS;
DELAWARE CITY AND ST. GEORGES, DEL-NJ

figure 2.1

**SITE LOCATION MAP
INTERIM MEASURES
HEALTH AND SAFETY PLAN
*OxyChem, Delaware City, Delaware***





TABLES

TABLE 2.1
EXPOSURE ROUTES AND EXPOSURE LIMITS
FOR THE CHEMICAL COMPOUNDS PRESENT AT THE SITE
IM PROGRAM
OCCIDENTAL CHEMICAL CORPORATION
DELAWARE CITY, DELAWARE

<i>Chemical Compound</i>	<i>Ionization Potential</i>	<i>Exposure Routes</i>	<i>Acceptable Exposure Levels in Air</i>
Benzene	9.24	Inhalation, Ingestion, Skin Absorbtion, Contact*, Carcinogen**	0.5 ppm ⁽¹⁾ 1 ppm ⁽²⁾ 5 ppm ⁽⁴⁾ 500 ppm ⁽³⁾
Carbon Tetrachloride	11.47	Inhalation, Ingestion, Skin Absorbtion, Contact*, Carcinogen**	5 ppm ⁽¹⁾ 10 ppm ⁽²⁾ 25 ppm ⁽⁵⁾ 200 ppm ⁽³⁾
Chlorine	11.48	Inhalation, Contact*	0.5 ppm ⁽¹⁾ 1 ppm ⁽⁴⁾ 10 ppm ⁽³⁾
Chlorobenzene	9.07	Inhalation, Ingestion, Contact*	10 ppm ⁽¹⁾ 75 ppm ⁽²⁾ 1000 ppm ⁽³⁾
1,2-Dichlorobenzene	9.06	Inhalation, Ingestion, Skin Absorbtion, Contact*	25 ppm ⁽¹⁾ 50 ppm ⁽⁴⁾ 200 ppm ⁽³⁾
1,4-Dichlorobenzene	8.98	Inhalation, Ingestion, Skin Absorption, Contact*, Carcinogen**	10 ppm ⁽¹⁾ 75 ppm ⁽²⁾ 150 ppm ⁽³⁾
Mercury	NE	Inhalation, Ingestion, Skin Absorption, Contact*	0.01 mg/m ³ ⁽¹⁾ ⁽²⁾ 2 mg/m ³ ⁽³⁾
Vinyl Chloride	9.99	Inhalation, Contact*, Carcinogen**	1 ppm ⁽¹⁾ 1 ppm ⁽²⁾ 5 ppm ⁽⁴⁾ NE ⁽³⁾

Notes:

- (1) 2000 Values, American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLVs).
- (2) Federal Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit (PEL).
- (3) Immediately Dangerous to Life and Health (IDLH).
- (4) Federal OSHA 15 minute ceiling standard.
- (5) Federal OSHA 5 minute exposure limit.
- mg/m³ Milligrams per Cubic Meter.
- ppm Parts per Million.
- NE Not Established.
- (*) Contact: Skin and/or eye contact will add to total exposure
- (**) Carcinogen: Potential or Known Carcinogen

TABLE 2.2

**MAXIMUM DETECTED CONCENTRATIONS FOR THE
CHEMICAL COMPOUNDS PRESENT AT THE SITE
IM PROGRAM
OCCIDENTAL CHEMICAL CORPORATION
DELAWARE CITY, DELAWARE**

Chemical Compound	Benzene		Carbon Tetrachloride		Chlorobenzene		1,2-Dichlorobenzene	
	soil (µg/kg)	groundwater (µg/L)	soil (µg/kg)	groundwater (µg/L)	soil (µg/kg)	groundwater (µg/L)	soil (µg/kg)	groundwater (µg/L)
Sand Blast Grit Area	2	NA	ND	NA	18	NA	ND	NA
Stormwater Drainage Channels and Outfalls - Sediment	2,900	NA	6	NA	15,000	NA	5,300	NA
Groundwater Downgradient of the Process Area	NA	ND	NA	330	NA	4	NA	3
Hg Contaminated Soil Beneath the Process Area	NI	NA	NI	NA	NI	NA	NI	NA
OxyChem Tributary - Sediment	ND	NA	ND	NA	ND	NA	160	NA
SD-6 Area - Sediment	ND	NA	ND	NA	ND	NA	96	NA
Old Brine SL	3,800	ND	ND	ND	ND	ND	ND	ND
New Brine SL	NI	9	NI	ND	NI	ND	NI	ND
Chem Fix Test	35	36	ND	97	37	ND	ND	2
Waste Lake No. 1	1,800,000	78,000	48,000	34	3,400,000	280,000	7,000,000	9,400
Waste Lake No. 3	70	1	ND	ND	1400	ND	ND	ND
Metachem Pipeline	340	85,000	ND	1	26,000	82,000	52,000	3,000

Notes:

√A - Not Applicable

√D - Not Detected

√I - No Information

TABLE 6.1

SPECIFIC PERSONAL PROTECTION LEVELS

IM PROGRAM

OCCIDENTAL CHEMICAL CORPORATION

DELAWARE CITY, DELAWARE

<i>Work Tasks</i>	<i>Maximum Protection Levels ⁽¹⁾</i>	<i>Alternative Protection Levels ⁽²⁾</i>
Mobilization and Demobilization of Labor, Materials, and Equipment to and from the Site	Level C	Modified D
Isolation of all Utilities	Level C	Modified D
Drilling	Level C	Modified D
Excavation	Level C	Modified D
Construction	Level C	Modified D
Groundwater Sampling Activities	Level C	Modified D
Sediment Sampling Activities	Level C	Modified D
Soil Sampling Activities	Level C	Modified D
Phytoremediation	Level C	Modified D
Personnel and Equipment Decontamination Activities	Level C	Modified D

Notes:

Specific requirements of protection levels are detailed in Section C.6.1.

- (1) - Level C: To be worn when the criterion for using air-purifying respirators (APRs) are met and a lesser level of skin protection is needed.
Modified Level D: To be worn when dermal protection is required, however, no respiratory hazards are present. It provides minimal protection against chemical hazards.
- (2) - Alternate protection levels will be used if monitoring indicates that conditions are appropriate or the HSO and CRA Industrial Hygienist agree that there is a reduced or increased potential of exposure

TABLE 7.1

**ANTICIPATED HAZARDS/RISKS AND APPROPRIATE PRECAUTIONS
IM PROGRAM
OCCIDENTAL CHEMICAL CORPORATION
DELAWARE CITY, DELAWARE**

<i>Activity</i>	<i>Anticipated Hazards/Risks</i>	<i>Appropriate Precautions</i>
1. Mobilization and Demobilization Activities, Isolation of all Utilities	<ul style="list-style-type: none"> • slip/trip/fall hazards • potential back injuries from lifting heavy objects • potential heat or cold stress • severe weather • electrical hazardous from power sources • moving or backing vehicles • cuts to hands from working with sharp objects or fencing material • biological hazards (i.e., poisonous plants, insects, animals and Ticks(may cause Lyme Disease) 	<ul style="list-style-type: none"> • Level C or Modified D personal protection • practice safe lifting techniques • participate in on-Site training program • practice good personal hygiene principles • use a spotter around moving or backing equipment • work activities will be reduced or suspended during severe weather conditions • Ground Fault Circuit Interrupters (GFCIs) should be used to reduce the hazard of electrical shock. Do not stand in water when handling equipment. • Electrical equipment will be approved. • keep first aid supplies readily available • wear leather gloves when working with sharp objects • perform an underground utilities location
2. Drilling, Excavation and Construction Activities, Sampling Activities, Phytoremediation, Personnel and Equipment Decontamination Activities	<ul style="list-style-type: none"> • slip/trip/fall hazards • potential back injuries from lifting heavy objects • potential heat or cold stress • severe weather • electrical hazards from power sources • moving or backing vehicles and equipment • personnel injuries from sharp objects, falling debris, or pinch points • direct contact with potentially contaminated soils and groundwater • hazards presented by the use of heavy equipment • loud noise • overhead and underground hazards (i.e., electrical lines, gas, or water lines) • potential burns from hot equipment • hazards presented by the use of specialized equipment (e.g., decontamination equipment) • hazards presented by entry into a confined space (i.e., oxygen deficient, falling overhead objects) • reduced field of vision from wearing full-face respirators • biological hazards (i.e., poisonous plants, insects, animals and Lyme Disease) 	<ul style="list-style-type: none"> • Levels C and Modified Level D, based on realtime air monitoring or established protection levels (see Table 6.1) • practice safe lifting techniques • participate in all on-Site training programs • be trained with all appropriate equipment standard operating procedures • practice good personal hygiene principles • take proper precautions in unsafe areas • use the "Buddy System" • use a spotter around moving or backing equipment • only essential personnel allowed in work area • follow employer specific Standard Operating Procedures (SOPs) • keep first aid supplies readily available • if performing confined space entry work, make sure permit system is in place and workers have participated in a training program • identify all high temperature objects or equipment • work activities will be reduced or suspended during severe weather conditions • GFCIs should be used to reduce the hazard of electrical shock. Do not stand in water when handling equipment. Electrical equipment will be approved.

APPENDIX A

TRAINING ACKNOWLEDGEMENT FORM

TRAINING ACKNOWLEDGEMENT FORM

I have received and instructed in and understand the Site Safety Plan. I have been informed who to contact if I have any questions and know where to report any additional health and safety hazards. I agree to work to the safety plan guidelines and understand that failure to do so could result in removal from the Site.

[illegible]

APPENDIX B

DAILY SAFETY MEETING LOGS

DAILY SAFETY MEETING LOG

PROJECT: _____ LOCATION: _____
DATE/TIME: _____

1. Safety Issues or Topics Discussed:	
2. Work Summary and Physical/Chemical Hazards of Concern:	
3. Protective Equipment/Procedures:	
4. Emergency Procedure:	
5. Signatures of Attendees:	

APPENDIX C

EMERGENCY HOSPITAL ROUTE



APPROXIMATE DISTANCE = 7 MILES
 APPROXIMATE TRAVEL TIME = 10 MINUTES



figure 7.1
 EMERGENCY HOSPITAL ROUTE
 OXYCHEM DELAWARE CITY SITE
Delaware City, Delaware